

What is claimed is:

1. A composition for producing a porcelain enamel having a metallic appearance, comprising:

a first mixture which forms a polyoxide surface crystal having a metallic appearance when the composition is heated to a temperature ranging from about 700 to about 1,000°C and which is comprised of:

from about 0.7 to about 2 wt. % of NiO;

from about 2.5 to about 8 wt. % of MnO₂; and

from about 5 to about 11 wt. % of TiO₂; and

remainder a second mixture which is a porcelain enamel forming mixture.

2. The composition according to claim 1, further comprising at least one of:

from about 0.2 to about 0.8 wt. % of CuO;

from about 0.05 to about 0.3 wt. % of CoO; and

from about 0.2 to about 0.6 wt. % of Fe₂O₃.

3. The composition according to claim 1, further comprising:

from about 0.2 to about 0.8 wt. % of CuO.

4. The composition according to claim 1, further comprising:

from about 0.05 to about 0.3 wt. % of CoO, and

from about 0.2 to about 0.6 wt. % of Fe₂O₃.

5. The composition according to claim 1,

wherein the first mixture comprises:

about 1 wt.% of nickel oxide (NiO);

about 6 wt.% of manganese oxide (MnO₂); and

about 9 wt.% of titania benelite (TiO₂);

wherein the first mixture further comprises:

about 0.5 wt.% of copper oxide (CuO);

about 0.3 wt.% of cobalt oxide (CoO); and

about 0.3 wt.% of iron oxide (Fe₂O₃); and

wherein the second mixture comprises:

about 40.9 wt.% of silica (SiO₂);

about 19 wt.% of borax (Na₂B₂O₇);

about 3 wt.% of potassium nitrate (KNO₃);

about 6 wt.% of potassium carbonate (K₂CO₃);

about 12 wt.% of potassium silicofluoride; and

about 2 wt.% of sodium tripolyphosphate.

6. A glass frit, comprising the composition of claim 1 and having

from about 5 to about 11 wt. % of TiO₂;

from about 2.5 to about 8 wt. % of MnO₂; and

from about 0.7 to about 2 wt. % of NiO.

7. The glass frit according to claim 6, further comprising at least one of:

from about 0.2 to about 0.8 wt. % of CuO;

from about 0.05 to about 0.3 wt. % of CoO; and

from about 0.2 to about 0.6 wt. % of Fe₂O₃.

8. The glass frit according to claim 6, further comprising:

from about 0.2 to about 0.8 wt. % of CuO.

9. The glass frit according to claim 6, further comprising:

from about 0.05 to about 0.3 wt. % of CoO, and

from about 0.2 to about 0.6 wt. % of Fe₂O₃.

10. An article coated with a porcelain enamel having a metallic appearance, comprising:

a substrate which may be fired at a temperature effective to melt the composition according to claim 1;

a porcelain enamel coating which is provided on the substrate, which is comprised of the composition according to claim 1, which has a thickness ranging from about 10 to about 300 μ m, and which has a metallic appearance.

11 A method for providing a porcelain enamel coating having a metallic appearance on a substrate, comprising:

providing a composition according to claim 1;

coating the composition on the substrate to provide a coating precursor layer; and
firing the coating precursor layer at a temperature effective to produce the
porcelain enamel coating having a metallic appearance.

12. A method for producing a porcelain enamel coating having a metallic
appearance, comprising:

providing a composition according to claim 1;
preparing a glass frit from the composition by smelting the composition at a
temperature effective to melt the composition and provide a melt;
allowing the melt to cool to a glass followed by fracturing to provide the glass
frit;
grinding the glass frit into a powder;
applying the powder onto a substrate to provide a coating precursor layer;
firing the coating precursor layer at a temperature ranging from about 700 to
about 1,000°C to provide a porcelain enamel coating; and
allowing the porcelain enamel coating to cool to room temperature.

13. The method according to claim 12, wherein smelting the composition takes
place at a temperature ranging from 1,000 to 1,250°C.

14. The method according to claim 12, wherein the substrate is one of a metal, a
ceramic, or a glass.

15. The method according to claim 14, wherein the substrate is steel.